13 AUDIO ANALYSES

13.1 Purpose

Audio analysis includes the application of various techniques in order to clarify the intelligibility of audio signals recorded onto magnetic tape, digital media, video recordings or other media. Certain inherent qualities of audio evidence prohibit the establishment of a rigid set of standard procedures to cover each and every case; therefore, enough latitude has been given to allow for independent thought and individual freedom in selection alternative courses of action.

13.2 Scope

This procedure applies to analog and digital audio recordings that have undergone preliminary and optimization examinations and in which clarification may be deemed necessary.

The following equipment and materials may be used during the analysis process:

- Consumer and professional analog and digital tape players/recorders
- Analog and digital filters
- Fast Fourier Transform (FFT) analyzer
- Analog and digital gain reduction devices
- Professional headphones
- Digital audio storage devices
- Cables and cable connectors
- Magnetic tape developer
- Computer hardware and software

13.3 Limitations

It is not always possible to improve the intelligibility of the voice signal information, especially in instances of extremely poor signal-to-noise ratio or severe distortion.

13.4 Safety

None for this procedure

13.5 Procedures

13.5.1 Audio evidence will be received in accordance with the Department's evidence handling policy (see Section 20 in the Quality Manual).

13.5.2 If the media has a device (mechanical or otherwise) to prevent overwriting, the evidence will be enabled prior to analysis. Any portion removed from the original evidence will be retained and then returned with the original submitted evidence when the analysis is completed.

13.5.3 A general physical inspection of the submitted evidence will be conducted and will include, as appropriate, the cassette, reel(s), and the tape media itself, to ensure there are no obvious defects.

13.5.4 Tape markings, track development, signal analysis, or the Investigator's description will be used to make a determination, if possible, as to whether the submitted media is the original recording or a duplicate. If the submitted media is a duplicate, the Investigator will be contacted and the original recording will be requested. The examination of the duplicate will be terminated. If the submitted media is the original, or the only copy available, the examination will continue with 14.6.

13.5.5 Make, model, and settings of the device used to produce the submitted recording will be determined, if possible. These settings may include information such as the recording format, speed, and method of the recording (body microphone, telephone, etc.). If this information is not included on the RFLE, the Investigator will be contacted for the necessary information. If this information is not available from the Investigator, the equipment used for analysis will be chosen through visual inspection or electronic analysis using available audio or video recorders/players. Settings will be determined in order to optimize the output signal. If none of the available players can provide adequate output signals, the Investigator will be requested to submit the original recording device.

- Note: Any action or equipment that may damage the original recording is inappropriate and should not be used. Such actions may include, but are not limited to, maintaining the recording in the "pause" mode for extended periods, unnecessarily repeated playback of the recording, and proximity to strong magnetic fields.

13.5.6 An overall review will be conducted to determine the approximate length of the recording, tape speed, and type of information recorded in order to generally categorize the problems limiting intelligibility.

13.5.7 An overall FFT review will be conducted, if appropriate, for analysis of speech frequency range, discrete tones, banded noise, and other significant information.

13.5.8 At the examiner's discretion, a working copy of the pertinent segment may be generated utilizing an available digital recorder or digitized onto an appropriate digital media.

13.5.9 The audio signal may be analyzed using a number of processing operations that may include, but are not limited to, the following:

- Band pass filtering
- Deconvolutional filtering
- Comb filtering
- Adaptive filtering
- Parametric filtering
- Compressor-limiter functions

13.5.10 Once analyzed, the processed audio signal(s) is recorded to standard analog tape, digital tape, CD's DVD's or other digital media, depending upon the Investigator's request and the examiner's discretion.

13.6 References

Owner's Manuals, User's Manuals and vendor specific manuals and appropriate software manuals should be referenced for equipment operating instructions.

Digital Audio Corporation training manuals.

Ballou, Glen M., ed. Handbook for Sound Engineers the New Audio Cyclopedia. 2nd ed. Carmel, IN: SAMS, 1987.

Koening, Bruce E. "Authentication of Forensic Audio Recordings", Journal of the Audio Engineering Society, vol. 36, No. 36, No. 1/2, 1990 January/February.

Solari, Stephen J., Digital Video and Audio Compression. New York: McGraw-Hill, 1997.

Watkinson, John. The Art of Digital Audio. 2nd ed. Oxford: Focal Press, 1994

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